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### A review of " Decision and Control:" The Meaning of Operational Research and Management Cybernetics. By Stafford Beer. (John Wiley & Sons, 1966.) [ Pp. xii-j-556.]

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*Attention and Performance.* By A. F. SANDERS (Editor). (Amsterdam: North Holland Publishing Co., 1967.) [Pp. xi+452.] 120s.

This volume constitutes the proceedings of a symposium held at Driebergen, Holland, in August 1966, under the auspices of the Institute for Perception RVO-TNO, Soesterberg. The symposium was organized by Dr. A. F. Sanders, who is to be congratulated on his success in obtaining the co-operation of over 80 per cent of the distinguished invitees in producing papers on this contemporary field of psychology, one which is of wide interest to a growing number of research workers. The emphasis throughout is on theory rather than application; this is *not* a book for the practising ergonomist.

In order (as Dr. Sanders says in his preface) to achieve the closest approximation to the book-form in which the results of the symposium were pre-planned to appear, the meeting was split into six sessions, each devoted to a specific topic. Thus there are 11 papers on 'Single-channel theory and information processing', 12 on 'Reaction processes', 4 on 'Physiological correlates of attention and reaction time', 7 on 'Short-term memory and information processing', 5 on 'Eye-movements and visual search', and 7 on 'Long-term performance'. Most of these 46 papers are short and of relatively high quality. Inevitably there is some degree of overlap, and also, as can be seen by the above breakdown, a certain imbalance in coverage. Such shortcomings are, of course, almost unavoidable in a symposium of this magnitude, but one may venture to suggest that, had rather less stress been laid on the (by itself laudable) objective of publishing the proceedings as rapidly as possible, some judicious selective editing and the addition of perhaps one or two papers from invitees unable to attend might have improved the overall worth of the volume as a *book*. Considerable value might also have accrued from the inclusion of some of the discussion which must surely have followed the presentation of the papers (cf. the Santa Barbara symposium on Vigilance, in which the discussion provides a most illuminating insight into the real problems in that field).

In these days of proliferating journals, and exponentially increasing rates of contribution to them, the bringing together into one volume of the views of a substantial proportion of leading workers, which otherwise would (and probably will) be spread over a wide range of outlets of varying degrees of inaccessibility, must naturally be accounted a boon to the harassed student of any aspect of human behaviour, not least the one considered in this volume. As an *entrée* into the exciting and rapidly progressing field of attention theory this book is obviously a must for intending researchers, despite the reservations noted above. The volume is well indexed, and the references provided by most of the contributors will be of considerable assistance to those who desire to investigate a particular approach to the subject in greater depth. It is only unfortunate that the price quoted will almost certainly mean that those for whom the work will have greatest value will be the very ones who are likely to have most difficulty in obtaining access to it. One can safely predict that the paper cover of library copies will rapidly require reinforcement, and can only hope that the next symposium on this field of research (progress in which surely deserves critical appraisal at frequent intervals) will take place before complete disintegration occurs.

W. P. COLQUHOUN.

*Decision and Control: The Meaning of Operational Research and Management Cybernetics.* By STAFFORD BEER. (John Wiley & Sons, 1966.) [Pp. xii+556.] 75s.

This book is a study of the processes of management with particular reference to the way in which scientists can be of assistance in advising managers on the consequences of decisions which they take and on the nature of the control processes which they should use. The areas covered by the book are Operational Research, which is presented as the technology of decision-making, and Cybernetics, which is presented as the science of control.

The author has an international reputation for his lucidity and trenchant views and the book serves to illustrate these two facets. Indeed it is difficult to recall

books on this subject which so well serve as an extension of the character of the author.

It is not a textbook. It does not present a series of standard results in a coherent framework, nor is it a handbook of techniques. Indeed, the word technique to the author is clearly a rude word of which he does not think very much. The book is rather a clarion call to action and is aimed at the enlightened manager.

The sections on the nature of Operational Research and of its activity abound in examples, and the reader is conducted through a rogues' gallery of delinquent managers. Had I been a past employer of the author I would have read this book with some nervousness, expecting to find myself exhibited therein as one of the more curious specimens of manager. The section on the relevance of Cybernetics is much more difficult to read than the earlier sections because the rich interplay of example and of model which occur in the first section of the book on Operational Research are here lacking. This is probably because Cybernetics itself is still a difficult concept to grasp in the sense of its individual and different nature. The basic postulate is that the processes of control have such common features, whether they arise in animals, plants or in a steelworks, that the logical process to follow when faced with a problem of control, for example in a coalmine, is to seek an appropriate analogy from the natural world. It is not clear why the process of control occurring in nature should of necessity be applicable to an industrial situation. The idea of a coherence between control processes in all situations is obviously attractive and one would like it to be so since the quest of the scientist is the quest of unifying laws. This leads one to wish that Cybernetics as a science could produce quantitative measures of the effectiveness of an organization structure and of a process of control. Management consultants of the more qualitative kind have, for many years, made their living on giving advice out of experience on the nature of organizational structure and of control. It would indeed be useful if both Operational Research and Cybernetics could, by now, have produced relevant measures of organization effectiveness. Until such measures as these are produced, it is going to be difficult for Cyberneticians to argue about control processes in other than a philosophical fashion.

The book is clearly exciting and relevant. The author would probably be disappointed if anyone who read it agreed with everything he said, since it is only through disagreement that one gets change and the book is aimed at producing change. Every manager and every management scientist will find points with which he would wish to argue with the author, but this is a measure of the book's merit rather than a criticism of any failure. The reviewer, as a professional Operational Research worker who is concerned with the teaching of the subject, will agree with many of the strictures which the author levels at the academic, for whom he has obviously little regard (and even less regard for the doctoral student). These strictures have a great deal of merit in them. On the other hand it is no solution to the problem of training Operational Research workers in particular, or management scientists in general, to suggest courses, as does the author, which seem to encompass the whole history and extent of human knowledge. For example, a course in management science which is proposed in the book includes the following: the philosophy of science; the history of science; general methodological tendencies in the development of the competent thought of mankind; basic teaching in psychology; the balance between the physical sciences, the biological sciences and the social sciences; basic economics and econometrics; the theory of the firm; marginal analysis and demand analysis; the approaches of financial and cost accounting; the study of investment policies; company law; the structure and behaviour of organized labour; basic engineering concepts, with particular reference to production engineering and control engineering; formal logic; the basic principles of ratiocination and formal logic; a deep comprehension of the nature of statistical variation; probability distribution; significance testing; correlation regression of the analysis of variance; stochastic processes and vector analysis; Boolean algebra; value analysis; predicate calculus.

One really wonders the extent to which it is possible to produce students with a proper knowledge of these subjects. The student is under great pressure to come out from the groves of academe and earn his living. It is difficult to see how a course

such as that outlined above could be achieved at the postgraduate level in under five years, especially as it would have to be combined with appropriate practical work in order that the student may continuously be testing the relevance of his theory in the practical circumstances of the problems which he studies. Surely the appropriate aim of postgraduate training in the management sciences is to carry out a ground-clearing operation so that the student may have a basic kit of tools which will enable him to carry out further advances himself.

No doubt similar arguments will concern the mind of everyone who is particularly acquainted with one of the special areas which the author covers. But we repeat that these quarrels which we have with the subject is part of the author's intention in writing the book. The author, probably more than anyone else, has forced Operational Research scientists into understanding the concept of the total system. For many years Operational Research has been in danger of splitting into a series of stylized ritual dances around the point of decision. The systematic approach of the author places all these dances within a coherent fabric of meaning. Of course this leads to one final question which one has to ask of this sort of approach. Somewhere the urge to create studies of larger and more comprehensive systems has to stop. We have, in the final analysis, to be satisfied with suboptimization at some level. Only God, the supreme Cybernetician, optimizes and it is sometimes difficult from the book to see where this process of suboptimizing should end. Equally, in the quest for a truly inter-disciplinary subject the course which the author produced will only be inter-disciplinary until it is taught. It will then be a coherent discipline of its own, for inter-disciplinary surely means cross-fertilization between existing subjects as we *now* define them. Once we switch to the sort of inter-disciplinary approach which the author suggests, and rightly suggests, we will very soon be under great pressure to come back to the inter-disciplinary approach of Physics or of Chemistry or of Biology.

Although this book is aimed at management it may well be that many executives will find it hard going. They should still persevere for the good of their souls. It is, however, more likely to form part of the classical reading list (especially for those who speak Greek, Latin and Hindi as well as English) of the management sciences student. There is one University Department where this book will be strongly recommended reading for all students and it is likely to form a landmark in the development of our thinking on this subject.

B. H. P. RIVETT.

*The Human Body in Equipment Design.* By A. DAMON, H. W. STOUT and R. A. MCFARLAND. (Harvard University Press and O.U.P., 1966.) [Pp. xvii+360.] 96s.

This is undoubtedly the most important book that has yet appeared on the related subjects of applied anthropometry and human biomechanics. Its scope is quite comprehensive, including what is still relevant of the more elderly results of research as well as the most recent developments. This breadth of treatment cannot have been easy for the authors, for the observations included straddle several scientific disciplines and have been the product of diverse methodologies of both investigation and practical application. Although the book will be chiefly used as a valuable source of data on the dimensional and mechanical characteristics of the human body and of human muscle action, it is in most respects a definitive textbook on these subjects.

A large proportion of research on anthropometry and biomechanics which has been carried out during the past twenty years has been associated with problems arising in the Armed Services. The reports on this research have been, in many instances, unique sources of information on several ergonomics topics. But the Services' reports had limited original circulation and many important ones are now becoming inaccessible. For anthropometric and biomechanical topics this deficiency of the permanent publication of Services' research is largely rectified in this book, for most of the results which have stood the test of time are given in detail in its pages. The value of this contribution to the permanent scientific record may be judged from a consideration of the book's very adequate bibliography;